[*Issued with Army Orders for January*, 1923.

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W.O.
8186

# GUN DRILL

FOR

# 9·2-inch B.L. Howitzer, Mark II,

## CARRIAGE, MARK II.

1923.



LONDON:
PUBLISHED BY HIS MAJESTY'S STATIONERY OFFICE.

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G.D. 50. *Price* 6*d. Net.*

*By Command of the Army Council.*

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## CONTENTS.

# GENERAL INSTRUCTIONS.



Practical instruction in the equipment should be given to each recruit before any attempt is made to instruct him in gun drill. In teaching the duties of each man at the gun, the instructor should try to impart the instruction by reasoning rather than by a long explanation in words. By means of questions he should try to draw from the recruit the correct answers as to the performance of his duties, being careful to lead the man's mind into the desired channel of thought. Should this attempt fail, the instructor should give a demonstration emphasizing the points the recruit has not grasped. Such demonstrations should deal with the work of each man in the detachment; and all men under instruction should, in turn, carry out the work of each particular man.

Instruction in gun drill should begin as soon as the men are conversant with all parts of the equipment, and can handle in the best and quickest manner each of the working parts of the gun. Once the work of each man has been thoroughly mastered, it should not take long for the recruit to learn the actual drill.

It is most important that a marked distinction should be drawn between instruction and drill.

During the former the language used should be as simple as possible, and the meaning of all technical terms which are necessary must be carefully explained. A conversational tone should be adopted and under no circumstances whatever should

anything in the nature of long quotations from drill books be allowed. The men should be permitted to assume an easy attitude and their interest should not be allowed to flag. They should be encouraged to ask questions.

At drill, on the contrary, rigid discipline must be maintained, orders must be clear and decisive and the detachments made to work steadily, smartly and rapidly. At the same time the utmost accuracy is essential and any deviations from the methods laid down must at once be checked.

### Nomenclature of Loads.

The equipment is divided into three loads which are called by the following names :—

| Load. | Drill book name. |
|---|---|
| Carriage bed. | Bed. |
| Carriage body with cradle. | Carriage. |
| Howitzer. | Gun. |

# CHAPTER I.—GENERAL DUTIES.

This chapter summarizes the duties of the section commander and each man in the detachment. It is only intended as a guide to the instructor, who should use his own words in explaining the various duties to the men.

The detachment is composed of fourteen men. The service of the gun is divided between them as follows :—

| | |
|---|---|
| **1** ... ... ... ... | in command. |
| **3** and **4** ... ... ... | the sights. |
| **2** and **5** ... ... ... | the breech. |
| **6** and **14** ... ... ... | the cartridges. |
| **1** and **7** ... ... ... | the loading derrick. |
| **8** ... ... ... ... | the loading gear. |
| **9, 10, 11, 12** and **13** ... | the shell. |

On coming into action all small stores, not actually required for each round, will be placed in a convenient position normally on the right of the gun.

The duties of the section commander and each man are as follows :—

## DUTIES OF SECTION COMMANDER.

NOTE.—*On service it may not always be possible for section commanders to be with their sections in action, and it may be inadvisable to withdraw a No.* **1** *from his gun to act as section*

*commander. In this case such of the following duties as affect both guns will be performed by the G.P.O. (gun position officer), and such as affect individual guns by the Nos.* **1**.

1. He COMMANDS his section and is responsible for the serviceability of its EQUIPMENT and the correctness of its DRILL.

2. He places himself where he can best see and hear the B.C. or G.P.O., and will only move about when necessary for the supervision of his section. In ordinary circumstances he should be on the flank of his section nearest the command post.

3. He will acknowledge orders from the command post by saluting with the hand nearest the G.P.O., finishing with the hand vertically above the head.

He only passes ORDERS when he sees that his Nos. **1** or the neighbouring section commander have failed to acknowledge.

4. He supervises the TESTING and ADJUSTMENT of the sights of his section.

5. He keeps a RECORD of the MUZZLE VELOCITY, DROOP and JUMP of his guns, and also of their ZERO LINE READINGS to the AUXILIARY AIMING POINT and BATTERY PICKET. He will not keep any record of orders during a shoot.

6. He reports the CREST ANGLES to the G.P.O. when ordered to do so.

7. He is RESPONSIBLE that, before fire is opened on any target, his guns are layed in the DIRECTION ORDERED.

This is best done not by inspection of the sights, but by comparing the line of his two guns and the flank guns of the neighbouring sections by looking along the line of each with *reference to some distant object either in front or rear.*

8. He CONTROLS his section in action.

This control is best carried out by watching and listening rather than by personal *inspection of sights, &c., e.g.,* as regards deflection corrections, observation of which hand is used by **3** will ensure deflections being put on in the correct direction. As regards elevation, comparison of the elevations called out will expose any considerable error.

9. When his section is RANGING, if one gun miss-fires, he will fire BOTH ELEVATIONS from the other gun, the higher elevation first.

10. At BATTERY FIRE he will report to the G.P.O. when one of his guns MISSES ITS TURN.

11. He will REPORT to the G.P.O. when either of his guns goes OUT OF ACTION or when he finds that an ERROR has been made which is likely to have AFFECTED THE SHOOTING.

## Duties of 1.

1. He COMMANDS and is responsible for the entire service of his gun.

2. He gives the WORDS OF COMMAND detailed for him in Chapter II, and repeats all ORDERS affecting his detachment which have not been heard by the men concerned. His orders must be given clearly, but no louder than is necessary to enable his detachment to hear.

He assists in passing orders down the battery when necessary.

He acknowledges all orders by saluting. He will salute with the hand nearest the G.P.O., finishing with the hand vertically above the head.

3. He is responsible :—

(i) That the BUFFER is properly filled, that there is no leakage at the stuffing box, that the buffer is firmly nutted up to the lug of the gun, and the piston rod to the front of the cradle.

(ii) That the RECUPERATOR is correctly charged with liquid and air, that there is no leakage at the stuffing boxes and glands, and that the ram is secured to the crosshead of the gun. He sees that the tail rod indicator reads between 0 and 8 pints.

(iii) That the ACTUATING GEAR of the piston rod is properly assembled.

(iv) That the SIGHTS are tested. This is done under the supervision of the section commander.

4. At preparation for action, when the gun is mounted he procures the ADAPTER, PRESSURE GAUGE, buffer and recuperator SPANNERS and gun CORRECTION BOARD.

5. He ascertains, when ordered, the CREST ANGLE, and reports it to the section commander.

6. He selects the auxiliary aiming point and records on the slate the ZERO LINE angles from the auxiliary aiming point and battery picket. The auxiliary aiming point and battery picket must not be on the right of the gun ; the best position is about 60 degrees right or 120 degrees left of the zero line.

7. He occasionally examines the settings of the ELEVATION INDICATOR and DIAL SIGHT.

8.—(i) He applies—

(*a*) The GUN CORRECTION, except when laying by field (or large) clinometer.

(*b*) The POSITION CORRECTION which, if required, is ordered in the form :—

"POSITION CORRECTION. No.....plus (or minus).....mins."—

and is applied to all elevations ordered, but is cancelled when a fresh target is ordered.

(*c*) Corrections during fire for effect, which are ordered in the form :—

"No.....add (or drop).....mins."

These are cancelled when a fresh elevation is ordered.

(ii) When laying by field (or large) clinometer, he applies the INDEX CORRECTION (if any) of his clinometer, and passes corrected elevation to **4**.

9. He supervises the preparation and supply of AMMUNITION. As time fuzes deteriorate rapidly when unprotected from damp, only such as are required for immediate use will be uncovered. When one group of ammunition is nearly expended, he reports particulars of the next group to be used.

10. He sees that the caps of No. 106 fuzes have been removed. He supervises LOADING and assists **7** to raise the DERRICK. The shell should be rammed home vigorously with a good travel. The sound of the driving band engaging the rifling should be distinctly heard. Irregularity in ram-

ming causes irregular shooting, especially when the gun is worn. An improperly rammed shell may slip back when the gun is elevated and cause a premature.

He sees that the correct charge is loaded.

11. He gives the order to FIRE. The gun will on no account be fired without his order. Before giving this order he sees that the red lines on the breech and breech screw coincide, showing that the breech is properly closed, and that the gun is in all respects ready.

12. He is responsible that the INTERVAL between rounds is properly kept as regards his own gun. When a salvo or quick rate of battery fire (less than 5 seconds interval) is ordered, he extends his right arm above his head as soon as his gun is ready to fire.

13. At intervals he checks the LENGTH OF RECOIL. He compares the elevation given by the recoil indicator with the elevation on the elevation indicator.

14. When RAPID or PROLONGED FIRING takes place he takes every opportunity of attending to his equipment. The chamber, mushroom head and breech block should constantly be sponged with water. If the gun is hot, the bore should be cooled with water when "Stand easy" is ordered.

## Duties of 2.

1. He works the BREECH MECHANISM and FIRES the gun. He is responsible for the breech and muzzle COVERS. With **5** he tests and adjusts the OBTURATING PAD. He assists **5, 11** and **12** to RAM.

2. At preparation for action :—

(i) He straps the TUBE POCKET round his waist and fills it with tubes.

(ii) He places the LANYARD round his neck and tucks the ends into his belt.

(iii) He procures the VENT BIT, RIMER, OIL CAN, breech mechanism WRENCHES and SPONGE CLOTH.

3. (i) To OPEN the BREECH :—He takes hold of the lever breech mechanism with the left hand, thumb uppermost, and slides the hand down so as to press down the catch retaining, at the same time pulling the lever to the rear and then swinging it round to the right as far as it will go.

(ii) To CLOSE the BREECH :—The above procedure is reversed. The breech must on no account be slammed.

4. He assists **5, 11** and **12** to RAM. The shell is rammed home as follows :—

As soon as the shell has been brought into position by the derrick, **2** and **5** step on to the loading platform ; **12** hands the rammer to **2** and **5** ; **5** steadies the head of the rammer against the base of the shell (at drill, against the face of the breech), and, at the order " Half way," **2** and **5** push the shell forward until the base is 6 inches inside the face of the breech.

**11** and **12** step on to the loading platform in rear of **5** and **2**, and the four numbers reach out and grasp the rammer as far to the rear as convenient, inner hands back up and outer hands back down, facing the rear. **1** orders " Home " and the shell is rammed home with full force.

5. At the order "READY," he passes the loop of the firing wedge over the striker cap and pulls it towards him until the cap passes the projections on the wedge. He stands on the firing platform facing the front. He holds the toggle in his right hand and grasps the centre of the lanyard with his left hand.

6. At the order "FIRE," he jerks the lanyard smartly. The gun will on no account be fired without the order from **1**.

7. He oils and cleans the BREECH MECHANISM when necessary during firing.

After each round he wipes the head of the VENT AXIAL with a wet sponge cloth.

## Duties of 3.

1. He LAYS and is responsible for the SIGHT COVER. He directs **4** when planting AIMING POSTS. He assists **1** to test the SIGHTS.

2. At preparation for action he places the No. 7 DIAL SIGHT and carrier in the bracket.

3. (i) He lays for line. At DIRECT LAYING he also lays for ELEVATION. He lays for line on the left edge of the aiming point unless otherwise ordered.

(ii) At INDIRECT LAYING with ELEVATION INDICATOR, he sets the dial sight at the angle ordered. As soon as **4** has brought the longitudinal bubble approximately central he lays roughly for line. He cross-levels the sight and lays accurately for line. He reports "Set."

(iii) At INDIRECT LAYING with FIELD (or large) CLINOMETER he sets the dial sight and elevation

indicator at the angles ordered. Under the orders of 4 he elevates and depresses until the bubble of the field clinometer is approximately central.

He lays roughly for line, he cross-levels the sight and lays accurately for line. He reports "Set" and under orders from 4 depresses until the bubble of the field clinometer is central.

(iv) At DIRECT LAYING he sets the open sight at the deflection ordered. He lays roughly on the target. After 4 has reported "Set," he cross-levels the sight and lays accurately for line and elevation. He reports "Ready."

4. (i) When setting the dial sight by means of the QUICK RELEASE he moves the micrometer head through one complete turn to ensure that the teeth have re-engaged correctly.

(ii) When SETTING a right deflection on the dial sight he turns the right micrometer head away from him with his right hand; when setting a left deflection he turns the left micrometer head towards himself with his left hand.

(iii) When READING a left angle on the dial plate he reads the minutes off the left micrometer scale; when reading a right angle he reads the minutes off the right micrometer scale.

(iv) When LAYING for LINE he turns the top of the traversing hand-wheel to the left last.

5. At CHANGE TARGET if the angle is given as "More right (or left)," he turns the micrometer head of the dial sight through the angle ordered. If the angle is given from zero line, he sets the dial sight at the recorded zero line angle

and then turns the micrometer head of the dial sight through the angle ordered.

6. CROSSHEADS are fitted to aiming posts to compensate for lateral movement of the sight. Both crossheads have similar markings and numbers. He notes which corresponding pair of markings are in line and uses them to lay on. He directs **4** to clamp the crossheads low down, so that the bottom of the far one is just visible over the top of the near one.

7. The following are the signals used by **3** when directing **4** to plant aiming posts :—

| SIGNAL. | MEANING. |
|---|---|
| Right arm extended to the right or left arm extended to the left. | Move in the direction indicated. |
| Arm dropped... ... ... ... | Halt. |
| Both arms dropped sharply from above the head. | Plant. |
| Upward or downward motion of the arms with both arms extended laterally. | Raise or lower the crosshead. |
| Both arms extended above the head and moved laterally in the required direction. | Move head of post in the direction indicated. |
| Both arms extended sharply upwards. | Pick up. |
| Both arms extended to the front (or rear). | Move to plant the far aiming post. |
| Body turned about and both arms extended to the rear (or both arms extended to the front). | Come in. |

## Duties of 4.

1. He LAYS with **3** and plants AIMING POSTS. He assists **1** to test the SIGHTS.

2. At preparation for action he places the AIMING POSTS with crossheads clamped, on the right of the carriage, one yard clear, heads to the front, and places a FIELD (or large) CLINOMETER over his right shoulder.

When planting aiming posts he holds the post with the arm bent and elbow against the side at a convenient height, so that it hangs vertically with the point just clear of the ground. He moves to the right or left as directed by **3** until signalled to "Plant," when he allows the post to slip through the fingers until the point touches the ground. He then completes the planting.

3.—(i) He lays for ELEVATION except at DIRECT LAYING.

(ii) At INDIRECT LAYING with ELEVATION INDICATOR he sets the elevation indicator at the angle ordered. He elevates the gun until the longitudinal bubble runs to the front. He depresses the gun until the bubble is nearly in the centre of its run. As soon as **3** reports "Set" he depresses the gun until the longitudinal bubble is central. He reports "Ready."

(iii) At INDIRECT LAYING with FIELD (or large) CLINOMETER, he sets the field clinometer at the elevation ordered by **1** and places it on the clinometer plane. He orders **3** to elevate the gun until the bubble of the field clinometer runs to the front and to depress the gun until the bubble is nearly in the centre of its run. As soon as **3** reports

"Set" he orders him to depress the gun until the bubble of the field clinometer is central. He reports "Ready."

(iv) At DIRECT LAYING he sets the elevation indicator at the elevation ordered. He reports "Set."

4.—(i) When using the field (or large) CLINOMETER he sees that the clinometer plane and the base of the clinometer are free from grit or dirt, and that the clinometer is placed exactly on the positioning marks of the plane for each lay.

(ii) When SETTING the ELEVATION INDICATOR he turns the top of the elevation indicator hand-wheel towards himself last to take up backlash.

(iii) When LAYING he depresses last (top of the hand-wheel towards the muzzle) with at least two complete turns of the handwheel. If the bubble of the clinometer over-runs the centre he rapidly gives the elevating wheel two complete turns of elevation followed by one and a-half turns of depression before completing the lay.

## DUTIES OF 5.

1. He is responsible for the BREECH and CHAMBER, and assists **2** to test and adjust the OBTURATING PAD. He assists **2, 11** and **12** to RAM.

2. At preparation for action he places TALLOW and WASTE in a convenient position and the RAMMER, one yard to the right of the loading platform, head in line with the front edge.

3. He receives CARTRIDGES from **6** and loads them. He places the cartridge in the chamber so that the igniter faces the vent and is just clear of the mushroom head. If

the cartridge is thrown to the front of the chamber, either by **5** or by the closing of the breech screw, a miss-fire may occur.

## Duties of 6.

1. He is responsible for the supply of CARTRIDGES.

2. At preparation for action, he procures a SCREW-DRIVER or KEY, METAL LINED CASE.

3. He, assisted by **14**, sees that CARTRIDGES are :—

(i) SORTED by nature of propellant and "group" number.

(ii) STORED in cylinders or boxes and protected from extremes of temperature and from damp.

(iii) PREPARED correctly ; all sections bearing a higher number than the charge ordered are removed.

(iv) ISSUED from the group ordered.

4. When one group of cartridges is nearly expended, he REPORTS to **1** the particulars of the next group.

5. He carries CARTRIDGES to the gun. He holds the cartridge with the charge number upwards for **1** to check, but in wet weather he must keep the igniter dry. After **1** has checked the charge, he hands the cartridge to **5**, igniter to the left.

## Duties of 7.

1. He attends to the DERRICK.

2. At preparation for action he places the WINCH HANDLE in position and examines and lubricates the DERRICK.

3. He, assisted by **1**, works the DERRICK, **7** working in front and **1** in rear of the handle. As soon as the loading tray is in position on the loading platform, **7** lowers the derrick until the clips can be engaged. At the order "Raise" from **1**, **1** and **7** raise the shell into the loading position, working slowly for the first two turns of the winch handle. **7** holds the winch handle while the shell is rammed home. After ramming he lowers the derrick for the loading tray to be removed and then raises it through an angle of 30 degrees.

## Duties of 8.

1. He attends to the LOADING GEAR.

2. At preparation for action he procures a McMahon SPANNER.

3.—(i) To bring the gun to the LOADING POSITION he releases the locking pin by depressing the pedal with his left foot, and depresses the gun by means of the loading gear hand-wheel.

(ii) To bring the gun to the FIRING POSITION he removes his foot from the pedal and elevates the gun by means of the loading gear hand-wheel until the nut of the actuating rod clicks home, showing that the locking pin has engaged.

(iii) When elevating or depressing by means of the LOADING GEAR HAND-WHEEL he must take care to bring the gun to rest gently.

4. While the gun is being LOADED he retains the gun in the loading position by holding the loading gear hand-wheel.

## Duties of 9.

1. He prepares SHELL, and with **10**, **11** and **12** carries them to the gun.

2. At preparation for action he puts a FUZE KEY into his pocket.

3. He assists **10** to remove the SHELL BEARER.

## Duties of 10.

1. He prepares SHELL and with **9**, **11** and **12** carries them to the gun.

2. At preparation for action he places the SHELL BEARER with the shell.

3. He assists **9** to remove the SHELL BEARER.

## Duties of 11.

1. He prepares SHELL and with **9**, **10** and **12** carries them to the gun. He assists **2**, **5** and **12** to RAM.

2. At preparation for action he puts a FUZE KEY into his pocket and places a LOADING TRAY with the shell.

3. He UNCAPS FUZES. On removing the cap of a No. 106 fuze he sees that the tape is correctly wound and that the ends of the shearing wire are visible.

If a No. 106 fuze has become uncapped or the wire and seal is found to be broken, the fuze is to be regarded as dangerous and treated accordingly.

4. After loading he removes the LOADING TRAY.

## Duties of 12.

1. He prepares SHELL and with **9**, **10** and **11** carries them to the gun. He assists **2**, **5** and **11** to RAM.

2. At preparation for action he places a LOADING TRAY with the shell.

3. He hands the RAMMER to **2** and **5** and replaces it after ramming.

## Duties of 13.

1. He is responsible for the preparation and supply of TUBES and SHELL.

2. At preparation for action :—

   (i) He puts a FUZE KEY into his pocket.
   (ii) He procures a BRUSH, HAMMER and FILE.

3. He sees that SHELL are :—

   (i) Scrupulously CLEAN, especially the driving bands. Brushes and water should be used if necessary.
   (ii) SORTED into groups by nature, driving band and weight.
   (iii) STORED standing up on clean planks.
   (iv) FUZED as ordered and protected from damp.
   (v) ISSUED from the group ordered.

4. When using No. 106 fuzes :—

   (i) He BREAKS the wire and seal on issuing the round. When a specified number of rounds have been ordered, that number only will be prepared. When preparing ammunition with No. 106 FUZE no safety cap is to be removed or the wire or seal

broken until the round is about to be loaded. If a No. 106 fuze has become uncapped or the wire and seal is found to be broken, the fuze is to be regarded as dangerous and treated accordingly.

(ii) He will put on one side shell with burred driving bands, and with wire or seal of No. 106 fuze broken, reporting particulars to **1**. When opportunity offers the burrs will be removed under instructions from **1**.

5. When one group of shell is nearly expended, he REPORTS to **1** the particulars of the next group.

6. Before REPLACING shell in the wagon or lorry :—

(i) H.E. shell, except those fuzed with No. 106E fuze will be unfuzed.

(ii) A shell fuzed with No. 106 fuze with wire or seal broken is on no account to be replaced in limber wagon or lorry.

## Duties of **14**.

1. He is the COVERER and is SECOND IN COMMAND of the detachment.

2. In action he assists **6** to prepare cartridges.

# CHAPTER II.—GUN DRILL.

Artillery Training lays down the principles of battery tactics, which vary little with different equipments. This Chapter details the orders given and the procedure by which these orders are carried out in batteries armed with the 9·2-inch Howitzer.

The procedure must be memorized and strictly adhered to.

The executive order is shown throughout as being given by the section commander, as will normally be the case during training. When orders can be heard throughout the battery they will be acted upon without repetition. Instructors will invariably employ the orders detailed for the section commander, even when drilling a single detachment.

## 1. POSITIONS AT DETACHMENT REAR.

The detachment falls in two deep, one pace between ranks, **1** on the right and **14** on the left of the front rank. **1** and **14** are not covered.

When the gun is limbered up, the front rank is three paces in rear of the carriage, **1** covering the off wheel.

When the gun is in action, the front rank is one pace in rear of the loading platform, **1** covering the right trunnion.

## 2. TO TELL OFF.

Section commander.

"... *section—Tell off.*"

**1** numbers himself **1**, the right hand man of the rear rank **2**, his front rank man **3**, and so on.

### 3. TO CHANGE ROUND.

Section commander.

" ... *section—Change round.*"

**1** takes a pace to the rear with his right foot and a pace to the left with his left. The left hand man of the rear rank takes a pace to the left with his left foot and a pace to the front with his right. At the same time the remainder of the front rank take a pace to the right and the rear rank a pace to the left.

(The detachment is then again told off.)

### 4. TO EXAMINE EQUIPMENT.

Examination of equipment will be carried out before leaving the gun park. When in action this procedure should be carried out at least once in every 24 hours, and advantage should be taken of any interval to examine and test equipment.

Section commander.

" ...*section—Examine equipment.*"

Each man checks his stores.

The section commander supervises the testing of sights and grouping of ammunition.

**1** sees that the bore is clear, that the buffer and recuperator are correctly filled and charged and that there is no leakage from the glands.

If the gun is mounted, he sees that the gun, buffer and recuperator are properly connected up and the cut-off gear in adjustment. He tests and adjusts the sights.

He generally supervises the work of the remainder of the detachment, satisfying himself that spare parts are inter-

changeable, small stores complete and the equipment in all respects ready for action.

**2** removes and replaces breech and muzzle covers. He examines the breech mechanism and with **5** tests and adjusts the obturating pad. He examines the firing lanyard and firing tubes.

**3** removes and replaces the sight cover. He examines the dial and open sights, apparatus illuminating sights, cross-levelling and traversing gears. He assists **1** to test and adjust the sights when in action.

**4** examines the aiming posts, elevation indicator, longitudinal bubble, field (or large) clinometer and elevating gear. He assists **1** to test and adjust the sights when in action.

**5** examines the breech and chamber. He assists **2** with the obturating pad.

**6** and **14** examine and group the cartridges.

**7, 8, 9, 10, 11, 12** and **13** examine and clean shell. They group shell and fuzes as ordered by the section commander.

When in action **7** examines the derrick and **8** the loading gear.

As soon as the examination is completed the detachment form detachment rear.

**1** collects reports and reports to the section commander "No....ready for action" or otherwise.

## 5. TO LAY THE HOLDFAST PLATFORM.

The platform is laid by two detachments under the supervision of the section commander.

The platform is brought up on lorries and halted in rear of the position.

The following stores are brought up:—

| | | | |
|---|---|---|---|
| Director ... ... | 1 | Picks ... ... ... | 6 |
| Tape, 100 feet ... ... | 1 | Shovels ... ... | 6 |
| Field level ... ... | 1 | Spades... ... ... | 6 |
| Aiming posts ... ... | 3 | Rammers, earth ... | 4 |
| Dragropes, heavy, pairs | 2 | Maul ... ... ... | 1 |
| Handspikes ... ... | 6 | Hammer ... ... | 1 |
| Planks, 10 feet ... | 2 | Crowbars ... ... | 2 |
| Rollers, 3-ft. by 6-in. ... | 2 | Spanner, MacMahon (or adjustable) ... ... | 1 |
| Waterproof cover, or tarpaulin ... ... | 1 | Lashing, 1½ inch. | |
| Tracing tape. | | Mineral jelly and waste. | |

The waterproof cover or tarpaulin is laid out clear of the position and stores are arranged on it.

The section commander lays out the centre line of the platform and traces the trenches.

The trenches are dug to the required depth and levelled in all directions; they should be kept as closely as possible to the dimensions traced.

The platform is unloaded from the lorries. It consists of the following parts:—

| | |
|---|---|
| 2 diagonal beams (right and left). | 8 pegs, securing bed. |
| 2 longitudinal beams (right and left). | 4 holding down bolts. |
| 1 cross beam. | 2 wheel guides, (ramps ground). |
| 1 skid, cross beam. | 5 bolts, various. |
| 2 tie rods (one long and one short). | |
| 15 planks. | |

NOTE.—The holes in the longitudinal beams for the holding down bolts must be stopped up with oily waste to prevent mud from getting in.

The bolts securing are put into position in the diagonal beams, and the beams are lowered into their trenches and secured together at the front end.

The skid, cross beam is lowered into its trench.

The diagonal beams and skid are tested for level and position and adjusted if necessary. The three angle irons must be in alignment.

The ten lower planks are placed in their trench in front of the diagonal beams.

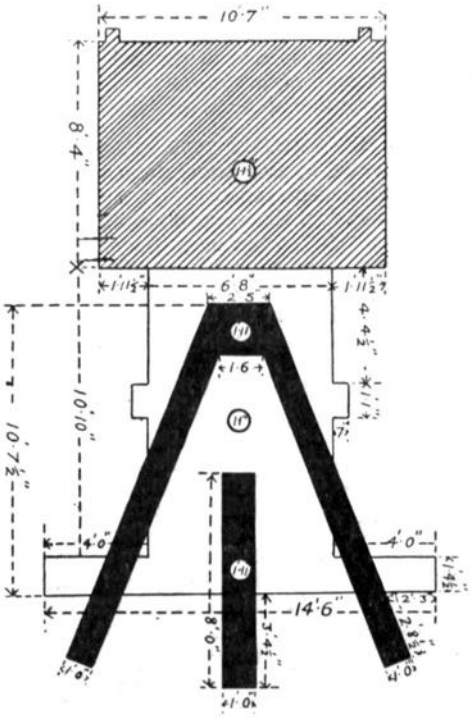
The cross beam is lowered into position over the diagonal beams and skid, its rear face butting against the angle irons, and is nutted up to the bolts of the diagonal beams.

The longitudinal beams are lowered into their trenches and pinned to the cross beam; the two tie rods are connected.

The longitudinal beams and cross beam are tested for level and adjusted if necessary.

DIAGRAM.

EXCAVATION FOR HOLDFAST PLATFORM.



The five upper planks and the pegs securing bed are placed clear on the right front of the platform.

The earth is rammed well round the outside of the beams flush with their tops.

The wheel guides are pinned to the bed peg sockets and two 10 feet planks are sunk in the ground in rear of the cross beam and in prolongation of the wheel guides.

## 6. TO MOUNT THE GUN.

The gun is mounted by two detachments under the supervision of the section commander.

"A" detachment does the work of mounting and assembling the gun and "B" detachment the moving of loads digging, &c. Even numbers work on the right and odd numbers on the left.

The gun and mounting on the three transporting carriages is halted in rear of the platform, and the engine draught connectors are unpinned.

The following stores are brought up:—

| | | | |
|---|---|---|---|
| Picks ... ... | 2 | Levers, ratchet ... ... | 3 |
| Shovels ... ... | 4 | Screws, raising ... ... | 3 |
| Scotches ... ... | 8 | Raising jacks and tommies | 2 |
| Waterproof cover or tarpaulin... ... | 1 | Winch handles ... ... | 4 |
| Rammers, earth | 2 | Bolts, securing carriage body to rear roller path ... | 4 |
| Crowbars ... | 2 | Holding down bolts ... | 4 |
| Handspikes ... | 2 | Ramping pieces ... ... | 3 |
| Maul ... ... | 1 | Monkeys and bars (Drivers, peg, 3¾ in., 24 in. long)... | 2 |
| Hammer, hide-faced | 1 | Broom, bass ... ... | 1 |
| ,, claw, 32-oz. | 1 | Oil can ... ... ... | 1 |
| Dragropes, heavy, pairs | 2 | Spanners, various. | |
| | | Mineral jelly and waste. | |

The waterproof cover or tarpaulin is laid out on the right of the platform and the stores are arranged on it.

**The bed.**

"B" detachment remove the earth box, platforms and derrick from the top of the bed and place them clear on the right front of the platform.

"A" detachment fix dragropes and haul the bed into position over the platform.

When it is in position the numbers take post as follows :—

**1** and **14** attend to the holding down bolts.

**2** and **4** at the right front raising screw.

**3** and **5** at the left front raising screw.

**6** and **7** at the rear raising screw.

**8, 9, 10** and **11** at the lock of the transporting limber.

**12** and **13** apply two handspikes to the locking plate from the front and assist in holding up the lock.

**1** and **14** remove the waste from the holes in the longitudinal beams.

**2, 3, 4, 5, 6** and **7** fix the lifting screws and ratchet levers, take the weight of the bed and remove the locking pins.

**8** shifts the lever steering pin to the "Rigid" position.

**2, 3, 4, 5, 6** and **7** lower the bed evenly on to the beams.

**1** and **14** screw up the holding down bolts.

**2, 3, 4, 5, 6** and **7** disconnect and remove the raising screws and ratchet levers.

**10** and **11** fold back the wings of the traversing arc.

**8** and **9** remove the travelling crosshead and replace the nut.

"B" detachment remove the wheels, odd numbers the front wheels, even numbers the rear wheels.

**The carriage.**

Both detachments haul the carriage into position over the bed.

"A" detachment take post as follows :—

**1** supervising the jacks.
**2** and **4** at the right jack.
**3** and **5** at the left jack.
**6** and **12** at the right raising screw.
**7** and **13** at the left raising screw.
**8, 9, 10** and **11** at the lock of the transporting limber.
**14** supervising the raising screws.

"B" detachment haul the gun in rear of the carriage.

**2, 3, 4** and **5** place the jacks under the front end of the carriage and take the weight.

**8** shifts the lever steering pin to the "Rigid" position.

**6, 7, 12** and **13** fix the ratchet levers, take the weight and remove the axle bracket screws.

**1** opens the axle brackets and removes the nut of the swivel bolt; odd numbers of "B" detachment remove the wheels and axle.

As soon as the wheels and axle are clear the earth box is erected and filled by "B" detachment.

The carriage is lowered evenly by means of the jacks and lifting screws.

**1** nuts up the bolts securing carriage body to pivot block.

**14** screws up the bolts securing carriage body to rear roller path.

**2** and **3** remove the jacks; **12** and **13** remove the ratchet levers.

**4** connects the foot lever of the loading gear to the bed.

**5** unlocks the travelling lock of the pivot block and fixes the rear laying platform.

**6** unpins the link connecting cradle.

**7** engages the pinion of the traversing rack.

Even numbers of "B" detachment remove the rear wheels.

**The gun.**

"B" detachment drive in the pegs securing bed and place in position the five upper planks. They continue filling the earth box and pile filled sand bags on top of the upper planks.

**4** and **5** of "A" detachment remove the rope securing gun and release the gun stops.

**1** removes the pin travelling lock.

**6** and **7** house the brakes.

**12** and **13** remove the block beating face.

"A" detachment haul the gun to the front until the guide rollers engage the bottom of the carriage ramps, **3** traversing the carriage and **7** traversing the gun as necessary.

"A" detachment take post as follows:—

**1** supervising.
**2** under the transporting wagon.
**3** on his laying platform.
**4** and **5** at the guide brackets.
**6** and **7** at the tie ropes.
**8** and **10** at the winding up gear on the right side.
**9** and **11** at the winding up gear on the left side.
**12** and **13** at the front wheels.
**14** sitting astride the buffer.
**2** releases the strut.
**8, 9, 10** and **11** fix the winch handles to the lower spindle.

**8, 9, 10** and **11** work the winch handles so that the tie ropes move forward; **6** and **7** secure the tie ropes to the carriage body.

**8, 9, 10** and **11** work the winch handles in the opposite direction and move the transporting wagon forward until the guide rollers reach the ends of the carriage ramps, **2** guiding the strut into the strut rest.

NOTE.—If the ground slopes upwards from the rear of the platform, **6** and **7** must place ramping pieces in the carriage ramps and **2** a ramping piece under the strut rest.

**8, 9, 10** and **11** shift the winch handles to the upper spindle.

**14** removes the buffer nut and buffer locking pin.

**3** elevates the cradle until it is in prolongation of the gun.

**8, 9, 10** and **11** work the winch handles until the guides of the gun are about to enter the guide ways of the cradle.

**3** adjusts the cradle so that the clearance on top of the guides is about twice that underneath the guides; **4** and **5** oil the guides and remove the pins of the guide brackets.

**8, 9, 10** and **11** continue working the winch handles; **4** and **5** withdraw the guide brackets just before they foul the breech.

When the gun is home:—

**14** replaces the buffer nut and inserts the split pin.

**1** inserts the recuperator cotter and split pin and screws on the beating face.

**12** and **13** remove the apparatus securing recuperator ram.

**8, 9, 10** and **11** shift the winch handles to the lower spindle.

**4** disconnects the hauling chain.

**8, 9, 10** and **11** run back the wagon.

**6** and **7** disconnect the tie ropes from the carriage and connect them to the wagon.

**2** secures the strut.

"B" detachment remove the wagon.

**The fittings.**

**3** and **4** fix **4's** platform.

**2** and **8** fix **2's** platform.

**5** fixes his platform.

**6, 7,** and **9** mount the loading derrick.

**10** and **11** swing the wings of the traversing arc into position and bolt them.

**12, 13** and **14** fix the loading platform and secure the strut rest to it.

As soon as the gun is mounted the detachment form detachment rear.

## 7. TO PREPARE FOR ACTION.

Preparation for action will be carried out when the gun is mounted.

Section commander.

"...*section*—"*Prepare for action.*"

Each man procures his stores and places them ready for use.

**1** sees that the bore is clear, the buffer and recuperator are properly connected up and the cut off gear in adjustment. He sees that the buffer and recuperator are correctly filled and charged, and that there is no leakage from the glands. He tests and adjusts the sights.

He satisfies himself that the detachment and equipment is in all respects ready for action.

**2** removes breech and muzzle covers. He examines the breech mechanism and with **5** tests and adjusts the obturating pad. He examines the firing lanyard and firing tubes.

**3** removes the sight cover. He examines the dial and open sights, cross-levelling and traversing gears. He assists **1** to test the sights.

**4** examines the aiming posts, elevation indicator, longitudinal bubble, field clinometer and elevating gear. He assists **1** to test and adjust the sights.

**5** examines the breech and chamber. He assists **2** with the obturating pad.

**6** and **14** examine and group the cartridges.

**7** examines and lubricates the derrick.

**8** examines and tests the loading gear.

**9, 10, 11, 12** and **13** examine and clean shell. They group shell and fuzes as ordered.

As soon as preparation for action is completed, **2** closes the breech.

The detachment form detachment rear.

**1** collects reports and reports to the section commander, "No....Ready for action," or otherwise.

## 8. POSITIONS IN ACTION.

**1** where he can best superintend the work of the detachment.

**2** on the firing platform on the right of the breech, facing the front.

**3** on the laying platform in rear of the dial sight, facing the front.

**4** on the platform on the left of the sight and facing it.

**5** on the platform on the left of the breech, facing the right.
**6** and **14** with the cartridges.
**7** in front of the winch handle, facing the rear.
**8** at the loading gear hand-wheel, facing the left.
**9, 10, 11, 12** and **13** with the shell.

## 9. TO FORM DETACHMENT REAR IN ACTION.

Section commander.

"*...section—Detachments rear.*"

**1** doubles to his place (one yard in rear of the loading platform and covering the right trunnion) and gives the order "No. ..., Double march."

At the order from **1** the remainder double to their places and halt.

## 10. TO TAKE POST FROM DETACHMENT REAR.

Section commander.

"*...section—Take post.*"

The detachment double to their positions in action.

## 11. TO OBTAIN THE LINE OF FIRE.

*The line of fire is obtained by one of the methods described in Artillery Training.*

## 12. TO LAY THE GUN IN THE LINE OF FIRE.

Section commander.

"*...section—Aiming point..., ... degs. ... mins. right (or left).*"

**1** orders "Take post to lay."

**3** sets the dial sight as ordered.

**4** sets the elevation indicator at 20 degrees and brings the bubble to the centre of its run by the elevating hand-wheel.

**3** brings the cross-level bubble approximately to the centre of its run and lays accurately for line with the traversing hand-wheel.

**1** points out the auxiliary aiming point and battery picket to **3**.

**3** reports to **1** the readings of the dial sight from the battery picket and auxiliary aiming point; **1** records them on the slate.

The section commander goes to his guns and takes a note of the angles recorded.

## 13. TO ASCERTAIN THE LOWEST ELEVATION AT WHICH THE TRAJECTORY WILL CLEAR THE CREST.

Section commander.

"*...section—Report crest angle.*"

**1** lays the gun just clear of the crest by looking along the bottom of the bore and ordering **4** to elevate and depress as required.

**4** then brings the bubble of the longitudinal level to the centre of its run by turning the elevation indicator hand-wheel and reports the reading on the elevation indicator to **1**.

**1** reports the result to the section commander, who passes it to the G.P.O.

The G.P.O. adds to the angle reported the elevation due to range to the crest, plus allowance for safety, and reports the resultant quadrant angle to the battery commander.

## 14. TO PLANT AIMING POSTS.

Section commander.

"*...section—Aiming posts front (or rear).*"

**4** doubles to the front (or rear) of his gun with two aiming posts and plants them as directed by **3** in line with the dial sight set at zero (or 180 degrees). He plants the near post first at about 50 yards from the gun. He then plants the further post as far from the gun as possible up to about 100 yards.

If the order "Re-plant aiming posts" is given, **4** doubles out and, at the signal from **3**, pulls up the posts, the further one first, and re-plants them.

## 15. PARALLEL LINES TO A NAMED GUN.

ZERO LINE METHOD.

Section commander.

"*...section (or No....)—Parallel lines to No....—Zero line method.*"

**3** of the named gun relays for line.

**1** of the named gun reports his angle right or left of his zero line.

This angle is ordered to the other guns.

AIMING POINT METHOD.

Section commander.

" *...section (or No....)—Parallel lines to No....—Aiming point method.*"

The section commander indicates an aiming point.

**3** of the named gun relays for line, swings his dial sight on to the aiming point and **1** reports the reading. This angle, corrected if necessary for parallelism, is ordered to the other guns.

DIRECTOR METHOD.

Section commander.

" *...section (or No....)—Parallel lines to No....—Director method.*"

**3** of the named gun relays for line, swings his dial sight on to the director and **1** reports the reading. The director is set accordingly and individual angles are ordered to the other guns.

## 16. TO LOAD.

### High explosive.

Section commander.

" *...section— H.E...., c.r.h. (fuze)..., (propellant) ..., Charge...*
" *...ranging (or method of fire).*"

**1** repeats the ammunition order and at the correct moment orders " Load."

**8** brings the gun to the loading position (if necessary).

**13** issues a shell; **9, 10, 11** and **12** carry the shell on the loading tray to the gun, **10** and **12** on the right, **9** and **11** on the left, **11** and **12** in front, and slide the tray into its guides on the loading platform.

**9** and **10** remove the bearer; **11** uncaps the fuze (if necessary).

**7** lowers the derrick; **11** and **12** engage the clips with the loading tray.

**1** orders "Raise"; **1** and **7** raise the shell into the loading position.

**12** supplies the rammer; **2** and **5** take post on the rammer; **5** steadies the head against the base of the shell; **7** steadies the winch handle.

**1** orders "Half way" and the shell is pushed forward until the base is 6 inches inside the face of the breech.

**11** and **12** take post on the rammer.

**1** orders "Home" and the shell is rammed home.

**12** replaces the rammer; **7** lowers the derrick; **11** removes the loading tray; **7** raises the derrick through 30 degrees.

**6** carries the cartridge to the gun, shows it to **1**, and hands it to **5**; **5** places it in the chamber and reports "In."

**2** closes the breech, places a tube in the vent and closes the lock.

**8** brings the gun to the firing position.

During ranging (except with "time set" fuzes) the gun will be reloaded as soon as it has been fired.

During ranging with "time set" fuzes the gun will be re-loaded as soon as the time setting has been ordered.

At a method of fire the gun will not be loaded sooner than is necessary to maintain the rate of fire.

After the first round:

If there is no alteration in ammunition ordered, **1** only orders "Load."

If there is an alteration in ammunition ordered, **1** repeats the ammunition order for the first round only.

NOTE.—At drill the rammer will be placed against the breech ring in the action of ramming home; only drill cartridges will be loaded.

## 17. TO LAY THE GUN.

### Indirect laying with elevation indicator.

Section commander.

"*...section—...degs....mins. more right (or left).*"
"*Position Correction—No.... plus (or minus)... mins.*"
"*(Elevation)...degs....mins.*"

**1** applies the position correction and gun correction (if any) and passes the correct elevation to **4**.

**3** puts on the deflection.

**4** sets the elevation indicator and elevates until the bubble runs to the front, and depresses until the bubble is nearly in the centre of its run.

**3** cross-levels, lays for line and reports "Set."

**4** depresses until the bubble is in the centre of its run and reports "Ready."

### Indirect laying with field (or large) clinometer.

Section commander.

"*...section—Clinometer laying—...degs. ...mins. more right (or left).*"
"*(Elevation)...degs....mins.*"

**1** applies the index correction (if any) and passes the corrected elevation to **3** and **4**.

**3** puts on the deflection and sets the elevation indicator.

**4** sets the field clinometer and places it on the clinometer plane; orders **3** to elevate until the bubble runs to the front and to depress until the bubble is nearly in the centre of its run.

**3** cross-levels, lays for line and reports "Set."

**4** orders **3** to depress until the bubble is in the centre of its run, reports "Ready," and removes the clinometer.

NOTE.—When laying with field (or large) clinometer, the elevation ordered is the actual elevation at which each gun is to be layed.

**Direct laying.**

Section commander.

"... *section—Target...*,"

"*Reference point...*,—... *o'clock ...degrees....*"

"*Open sights—...degs. ...mins. more right (or left).*"

"(*Elevation*) ... *degs. ... mins.*"

**3** puts on the deflection and

**4** sets the elevation indicator, and reports "Set."

**3** cross-levels and lays direct over the open sights on the ground line of his portion of the target, and reports "Ready."

If "Indirect" is ordered, **1** selects an auxiliary aiming point and points it out to **3**.

**3** turns the dial sight on to this aiming point. **4** sets the elevation indicator at the elevation ordered, and the gun is then layed indirect with elevation indicator.

## 18. TO FIRE.

No. **1**.

"*No. ...*"

"*Fire.*"

**1** orders "No...." shortly before it is his turn to fire.

**2** attaches the lanyard.

All face the front.

When his turn arrives **1** looks at the breech and orders "Fire."

**2** fires the gun and puts the lanyard round his neck.

**8** brings the gun to the loading position.

**2** opens the breech, ejects the tube and wipes the head of the vent axial with a wet sponge cloth.

The gun will on no account be fired without the order from **1**.

## 18. MISS-FIRES.

If the gun fails to fire, **2** re-attaches the lanyard and pulls it. If the gun again fails to fire, **2** allows ten seconds to elapse, ejects the tube and examines it.

(i) *If the tube has failed to fire* he examines the cap. If not fairly struck the lock is changed. If fairly struck a new tube is inserted. This tube is also tried twice; if it fails a second time, a pause of ten seconds is made and the lock is changed.

(ii) *If the tube has fired* a pause of three minutes is made; **4** then depresses the gun with the elevating handwheel until **2** can open the breech; after a further pause of one minute **1** removes and

examines the cartridge. If it is dry and serviceable, **1** re-adjusts it in the chamber. If it is damp or smouldering, he places it clear and orders a new cartridge to be loaded.

In the event of the tube failing to ignite the charge, care should be taken when extracting the tube not to stand directly in rear of the gun, as the tube may fly out with some violence as soon as the lock is clear.

The vent channel sometimes becomes choked with residue from the cartridge. When this occurs the taper portion should be cleared with a "Rimer," sufficiently to allow of the insertion of a tube, which, when fired, will remove the rest of the obstruction.

None of the detachments nor any cartridges should be in rear of the breech when it is opened.



## 19. TO CHANGE TARGET.

Section commander.

"*...section—Target....*"

"(*Ammunition*)...."

"*...deg....mins., right (or left) of zero lines.*"

**1** repeats the ammunition order and orders "Take post to lay."

**3** sets the dial sight to the recorded zero line angle and turns the micrometer head through the angle ordered. He lays roughly for line.

**6, 9, 10, 11, 12, 13** and **14** prepare ammunition.

Section commander.

" ...*ranging (or Method of fire).*"

" (*Interval*) "...(*if required*).

**1** at the correct moment orders " Load."
The gun is loaded.

Section commander.

" (*Elevation*) (*or Elevations*)...*degs.... mins.*"

**1** passes the elevation to **4**.
**4** sets the elevation indicator.
**3** lays for line and reports " Set."
**4** lays for elevation and reports " Ready."

## 20. TO STOP FIRING.

Section commander.

" ...*section—Stop.*"

The preparation of ammunition is suspended.
The detachment continue their duties but the gun is not fired until the order " Go on " is given.

## 21. TO STAND FAST.

Section commander.

"... *section—Stand fast.*"

All stand fast whatever they are doing.
At the order " Go on " work is continued.

## 22.—TO STOP LOADING.

Section commander.

"... *section—Stop loading.*"

The detachment continue their duties. Any gun already loaded is fired at its proper interval, but no gun will be loaded until the order "Go on" is given.

## 23.—TO EMPTY GUNS.

Section commander.

"*section—Empty guns.*"

Any gun loaded is layed at the last elevation and line and fired.

If a safety pin or cap has been removed before the order is given, the loading is completed and the gun fired.

## 24.—TO STAND EASY IN ACTION.

Section commander.

"... *section (or No. ...)—Stand easy.*"

This order is given to indicate that firing is temporarily suspended.

Before opening fire again the order "Take post" will be given.

## 25.—GUNS IN POSITION.

The procedure laid down in "Examine equipment" in the gun park must be carried out every 24 hours and when reliefs (if any) are carried out.

In addition **1** must see that the layers know the zero line angles to, and position of, the auxiliary aiming point and battery picket, and that all men of the detachment are conversant with the position of the command post and ammunition supply.

**1** will check the ammunition available for his gun.

## 26.—TO CEASE FIRING.

Before " Cease firing " is ordered guns must be empty.

Section commander.

" ...*section—Empty guns. Cease firing.*"

The gun is sponged out.

**4** brings the gun horizontal and inserts the buffer locking pin.

**2** closes the breech.

**3** sets the traversing gear at zero.

**4** brings in the aiming posts if ordered.

**8** disconnects the foot lever of the loading gear and connects it to the carriage.

The stores not required for dismounting the gun are replaced by the men responsible.

The detachment form detachment rear.

## 27. TO DISMOUNT THE GUN.

*The procedure is the reverse o that detailed in " To mount the gun."*

The pegs securing bed are withdrawn from the ground by inserting first a crowbar and later a handspike under the lip and using it as a lever of the first order with a suitable fulcrum.

## 28. TO PICK UP THE HOLDFAST PLATFORM.

*The procedure is the reverse of that detailed in "To lay the holdfast platform," the earth being first loosened round the outside of the beams.*

## 29. CASUALTIES TO DETACHMENTS.

Men sent up to replace casualties report to their section commanders who order such changes of duties as they consider necessary.

Casualties are replaced as follows :—

| | | |
|---|---|---|
| Section commander | ... | By the senior No. **1** of the section. |
| **1** ... ... | ... | By a named successor (usually **14**). |
| **3** ... ... | ... | By a named successor. |
| With thirteen men | ... | **12** performs the duties of **12** and **13**. |
| With twelve men | ... | **12** performs the duties of **12** and **13** ; **14** performs the duties of **14** and **6**. |
| With eleven men | ... | **12** performs the duties of **12** and **13** ; **14** performs the duties of **14** and **6** ; **9** performs the duties of **9** and **5**. |
| With ten men | ... | **12** performs the duties of **12** and **13** ; **14** performs the duties of **14** and **6** ; **9** performs the duties of **9** and **5** ; **8** disappears and **4** brings the gun to the firing and loading positions with the elevating hand-wheel. |

## 30. DISABLEMENT.

The extent of disablement ordered will depend on the time available and the probability of recapture.

*To disable the gun so that it can be brought into action immediately after recapture* : Close the breech, remove the carrier hinge bolt and lever breech mechanism.

*To disable the gun so that it can be brought into action after repair* : Remove the buffer nut and recuperator cotter ; fire a round with full charge.

*To destroy the gun* : Place an H.E. shell fuzed 101 E or 101 B in the muzzle ; load with H.E. fuzed 101 E or 101 B full charge ; fire the gun by means of a long lanyard from under cover. A length of telephone cable attached to the lanyard is suitable for the purpose.

NOTE.—The dial sight and clinometer should always be removed and taken away before abandoning a gun.

## 31. BLANK AMMUNITION.

1. No officer, non-commissioned officer or gunner who has not been trained and passed in gun drill is to command a section or form part of a gun detachment firing blank ammunition at salutes or at training.

2. When firing B.L. blank cartridges, no gun is to be reloaded within 30 seconds after firing. Even after this interval no gun is to be reloaded until the chamber and bore have been sponged out and examined by 1.

4. In the event of a miss-fire a further attempt should be made to fire the gun in its turn. In no case must the breech

be opened for at least one minute with black powder and ten minutes with smokeless charges. No one must be in rear of the breech when it is opened. In firing salutes, an officer or senior non-commissioned officer should be detailed for the special duty of timing the interval after a miss-fire and informing 1 of that gun when the breech may be opened.

# CHAPTER III.—LAYING TESTS.

1. In every battery there should be at least six qualified layers in each subsection, exclusive of serjeants and lance-serjeants. A list of layers should be kept. All layers, section commanders, serjeants and lance-serjeants should be tested periodically.

2. All officers and Nos. 1 must be thoroughly conversant with :—

(i) The tests for and care of sighting gear and sights.
(ii) The methods of obtaining parallel lines of fire.
(iii) The application of gun corrections.

3. Layers will be tested by means of two tests: test A will consist of four lays indirect, test B of two lays direct.

4. A maximum of 20 marks will be given for each lay in test A, and 10 marks for each lay in test B. In order to qualify a layer must obtain 81 marks.

5. The examiner should be assisted by an officer or senior non-commissioned officer with a stop-watch and record book, and by a penciller who will take down all orders given, for reference when checking the lay.

6. When laying indirect three or more aiming points should be selected to the rear and on either flank, if possible, and made known to all concerned.

7. Before beginning the tests at least five targets will be selected in the foreground at varying ranges and angles of sight, and covering a front of about 25 degrees; except in

the case of targets representing guns these should be natural features of the ground. If it be necessary to use dummies they should be placed in positions such as the troops which they represent would naturally occupy on service. A reference point, approximately in the centre of the target zone, will be pointed out to the No. **1** and to the layers; targets will be indicated with reference to this point by means of the clock code.

8. When laying direct on any target (other than a gun target) which extends over a fairly wide frontage, great exactitude in direction will not be required as regards the point originally selected to lay upon, which may be anywhere in that portion of the target opposite to the gun being layed. Any subsequent lay on the same target must, however, be on the same point as the first.

9. The orders for the lay must be given out by the examiner clearly and distinctly, a short pause (about two or three seconds) being made after each separate order, thus: "*All guns*, 20 *degs. right*"—pause—"*All guns*, 15 *mins. more right of zero lines*"—pause—"20 *degs.* 20 *mins.*"

All orders will be acknowledged by the No. **1** and acted on at once. Should a layer at any time be in doubt as to a particular order, he will refer to the No. **1**, who may repeat to him any part of the order received. The No. **1** may, in turn, refer to the examiner.

10. After checking a lay, the examiner will elevate the gun about 15 minutes.

11. Layers will be examined in pairs (Nos. **3** and **4**); for any incorrect part of a lay marks will be deducted only from the individual making the error.

12. The times allowed for each lay are as follows:—

| Test A. | | | | Test B. | |
|---|---|---|---|---|---|
| Lay 1. 1′ 00″ | Lay 2. 0′ 20″ | Lay 3. 0′ 50″ | Lay 4. 1′ 00″ | Lay 5. 0′ 30″ | Lay 6. 0′ 20″ |

The layer will call out "Ready" as soon as he has finished laying the gun. The time will be taken from the conclusion of the orders for the lay until the word "Ready" from the layer.

13. One mark will be deducted:—

(i) For every five seconds or fraction of five seconds beyond the time laid down for the particular lay.

(ii) For each mistake in the manipulation of the sighting gear or in the drill of the layer as laid down.

14. Ten marks will be deducted:—

If the aiming posts are not planted in line.

15. No marks will be given for the lay:—

(i) If the sight, clinometer, or elevation indicator is incorrectly set.

(ii) When laying indirect, if the gun is not correctly layed for elevation and direction.

(iii) When laying direct, if the gun is not layed for elevation within 3 minutes, or for direction within 5 minutes.

(iv) If the bubble of the cross level is not central.

## EXAMPLES OF TESTS.

### Laying tests.

The examiner sets the elevation indicator at about 20 degs. and the remaining scales at zero.

### Test A (indirect).

| Orders. | Procedure. |
|---|---|
| **Lay 1.** | |
| "*Aiming point,.....*" | The procedure will be as laid down under "To lay the gun in the line of fire." The battery picket and auxiliary aiming point readings will be recorded on the slate after 4 has reported "Ready." |
| "*All guns,* 90 *degs.* 10 *mins. right.*" | |
| "*Aiming posts front.*" | The procedure will be as laid down under "To plant aiming posts." Time for this part of the lay is not taken. |
| **Lay 2.** | |
| "*Charge two.*" | The procedure will be as laid down under "To lay the gun." |
| "*All guns,*1 *deg.* 10 *mins. more right.*" | |
| "25 *degs.* 40 *mins.*" | |
| **Lay 3.** | |
| "*Represent No.* 2 *gun in action.*" | The procedure will be as laid down under "To change target" and "To lay the gun." |
| "*Target.....*" | |
| "*Charge.....*" | |

**Test A (indirect)**—*cont.*

| Orders. | Procedure. |
|---|---|
| **Lay 3**—*cont.* | |
| " *All guns,* 2 *degs.* 15 *mins. more left.*" | The procedure will be as laid down under "To change target" and "To lay the gun." |
| " *Concentrate* 10 *mins. on No.* 1." | |
| " 20 *degs.* 20 *mins.*" | |
| **Lay 4.** | |
| " *Target*....." | The procedure will be as laid down under "To change target" and "To lay the gun." |
| " *All guns,* 11 *degs.* 15 *mins. right of zero lines.*" | |
| " *Clinometer laying.*" | |
| " 15 *degs.* 10 *mins.*" | |

NOTE.—In lays 2, 3 and 4 layers should be exercised and tested in laying from auxiliary aiming points or aiming posts at the discretion of the examiner.

**Test B (direct).**

The reference point is described before orders are given.

| Orders. | Procedure. |
|---|---|
| **Lay 5.** | |
| " *Represent No.* 3 *gun in action.*" | The procedure will be as laid down under "To lay the gun." |
| " *Infantry lining hedgerow,* 4 *o'clock,* 3 *degs. to* 5 *degs.*" | |
| " *Open sights.*" | |
| " 15 *degs.* 20 *mins.*" | |
| The examiner will put on a deflection and note the reading. | |
| **Lay 6.** | |
| " *All guns,* 40 *mins. more left.*" | The gun will be re-layed on the same point of the target as in lay 5. |
| " 15 *degs.* 50 *mins.*" | |

# CHAPTER IV.—SIGHT TESTS.

The field (or large) clinometer and elevation indicator should be tested daily and after prolonged firing. The alignment tests should be carried out as often as possible. At drill these tests should be carried out frequently to give officers and N.C.Os. practice in doing them accurately.

The remaining test (cross levelling gear) should be carried out occasionally, but adjustments must only be made by a qualified artificer.

Any adjustment to optical instruments must be carried out by a qualified artificer.

**Test 1.—To test the field (or large) clinometer.**

**To ascertain the index error.**

1. Set the clinometer to read zero (degrees and minutes), place the instrument on the clinometer plane of the gun, and by means of the elevating gear bring the bubble into the centre of its run. Turn the clinometer end for end. If the bubble does not remain in the centre of its run bring it there by moving the arm and slider (or drum). Note the net reading. Half this reading is the INDEX ERROR of the clinometer.

2. An alternative method may be employed. Procure a clinometer known to be in adjustment, set at zero, place it on the clinometer plane, and by means of the elevating gear bring the bubble central. Remove the clinometer. The clinometer to be tested is now placed on the clinometer plane and the bubble brought central by moving the arm and slider (or drum). The actual reading of this instrument is the

INDEX ERROR. A number of clinometers can be quickly and uniformly tested in this manner.

NOTE.—A clinometer when set to read its INDEX ERROR and with the bubble brought central will lay the clinometer plane horizontal.

The clinometer should be adjusted to have no INDEX ERROR, or if this is impracticable, the INDEX ERROR must be applied to all angles to be set on the instrument.

The method of eliminating or adjusting for INDEX ERROR is shown in the Handbook.

**Test 2.—To test and adjust the elevation indicator.**

With the longitudinal bubble in the centre of its run, the elevation indicator should read the elevation at which the gun is layed.

Place a shell in the chamber to take up play in the elevating gear.

Cross level the sight, lay the gun at 20 degrees elevation with a field (or large) clinometer; bring the longitudinal bubble to the centre of its run by the elevation indicator hand-wheel. The elevation indicator should read 20 degrees.

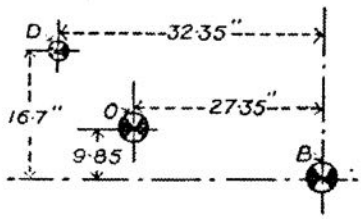
If the elevation indicator does not read 20 degrees, slacken the screws securing the clamping ring, revolve the elevation ring until it reads 20 degrees and re-clamp.

Remove the shell from the chamber.

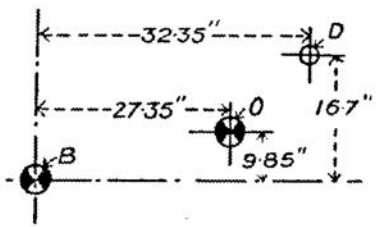
TARGET TESTING SIGHT.

9·2 IN. B.L. HOW. MK. II ON CARRIAGE, MK. II.

FOR USE IN FRONT OF GUN.




FOR USE IN REAR OF GUN.




KEY.

B = Bore of Gun.
O = Open Sights.
D = Dial Sight.



*To face page 56.*

**Alignment tests.**

Before beginning these tests the following preparations should be made :—

(i) Select a well-defined object at least 1,500 yards distant on which to lay.

(ii) If this distant object cannot be found, set up the target testing sights (see diagram) about 50 yards in front (or in rear) of the gun at right angles to the axis of the bore.

(iii) If the carriage is not level transversely, the top of the dial sight carrier and the target testing sights should be sloped to the same angle as the carriage.

(iv) Fix cross-wires at the muzzle of the gun.* (And at the breech if the target testing sights are placed in rear).

(v) Set the elevation indicator, the cowl of the dial sight, the dial plate and micrometer scales of the dial sight, and the deflection scale of the open sights at zero.

**Test 3.—To test and adjust the dial sight and open sights for line.**

The lines of sight through the dial sight and open sights should be parallel to the axis of the bore as regards line.

Lay the bore on the distant object for line by the traversing hand-wheel, using the intersection of the cross wires as a foresight and the axial vent as a hind sight. The lines of sight through the dial sight and the open sights should be on

* The cross-wires must be removed on completion of test.

the distant object. When using the target testing sights, lay the bore on point B; the dial sight should be on point D and the open sights on point O. (If the target testing sights is placed in rear lay the bore on point B by the intersection of the cross-wires on muzzle and breech.)

If the dial sight is not in alignment, turn the micrometer heads of the dial sight until the line of sight is correct, slacken the screws securing the reader of the dial plate and the nuts of the micrometers, shift the reader and micrometer scales to zero and re-clamp. If the open sights are not in alignment, turn the eccentric at the front vertical pivot of the rocking bar until the line of sight is correct.

**Test 4.—To test and adjust the dial sight and open sights for elevation.**

The lines of sight through the dial sight and open sights should be parallel to the axis of the bore as regards elevation when the elevation indicator is at zero.

Lay the bore on the distant object for elevation by the elevating hand-wheel. The lines of sight through the dial sight and open sights should be on the distant object.

When using the target testing sights, lay the bore on point B; the dial sight should be on point D and the open sights on point O.

If the dial sight is not in alignment, revolve the milled head at the top of the sight until the line of sight is correct, slacken the nut securing the micrometer collar, revolve the latter to zero and re-clamp. If the open sights are not in alignment, slacken the clamping nut at the bottom of the foresight, screw the foresight up or down until the line of sight is correct and re-clamp.

NOTE.—After adjusting the micrometer collar of the cowl of the dial sight the arrow on the view finder may not be opposite zero; if confusion is likely to arise this arrow should be erased and a new one scribed opposite the zero mark.

**Test 5.—Test for cross-levelling gear.**

Set the elevation indicator at zero and lay the gun horizontal.

Fix the plane testing in the carrier No. 7 dial sight; place a field clinometer set at zero along the transverse positioning marks. Bring the bubble of the field clinometer central by the cross-levelling gear. The bubble of the cross-level should now be central; if not, it needs adjustment. This should be done by a qualified artificer.

NOTE.—Until the "Plane, testing, carrier No. 7 dial sight" is in possession of batteries, the field clinometer will be placed on the top bearing surface of the carrier when testing cross-level.

# CHAPTER V.—CARE OF EQUIPMENT.

## 1. CLEANING AND OILING.

Limber gunners should be intelligent and reliable men.

The projections on the exterior of the gun, which form guides for the latter when sliding in the cradle, should be kept clean and oiled and maintained in good working order; all working surfaces should be well lubricated and kept free from paint.

The bore should be kept clean and lightly greased. After firing, it should be scrubbed with caustic soda and hot water (one pound to a gallon), using the piasaba brush. When dry it should be lightly greased with mineral jelly.

No gritty substance, such as sand paper or bath brick, should be used for cleaning working surfaces.

The traversing arc must be kept free from mud and grit and constantly greased with mineral jelly.

The pivot of the limber connector and the two dowels at the front of the bed must be kept clean and well greased, and protected, while the gun is in action, by canvas wrappings.

All spare parts should be used periodically to ensure that they are in working order.

Heads of lubricators should be kept free from paint.

## 2. List of lubricators.

| Fitting to be lubricated. | No. | Where situated. |
|---|---|---|
| Pivot plug ... ... ... | 1 | Left side of upper portion of pivot block. |
| Roller ring... ... ... ... | 25 | 1 in outer end of each roller axle. |
| Roller cage ... ... ... | 6 | On top of upper pivot block. |
| Connection for timber transporting bed. | 2 | On top of swivel tube connection. |
| Cradle ... ... ... ... | 11 | 1 on top of each capsquare for roller bearings.<br>4 on each side for guide-ways.<br>1 on spring stop of elevating arc. |
| Cut-off gear ... ... ... | 3 | 1 in trunnion collar.<br>2 in bracket supporting bevel segment spindle. |
| Traversing gear ... ... ... | 5 | 2 on handwheel spindle gear casing.<br>1 on worm wheel gear casing.<br>2 in bearings for worm spindle, one either side of worm. |
| Elevating gear ... ... ... | 10 | 3 on upper gear casing, left side.<br>2 on lower gear casing, left side.<br>1 on gear casing, right side.<br>4 in bearings for elevating shaft inside carriage brackets. |
| Loading gear ... ... ... | 8 | 6 on gear casing.<br>2 in bearings top of arm for cross spindle. |
| Sighting gear ... ... ... | 7 | 1 in circular collar of arc round trunnion.<br>2 in supporting bracket.<br>4 spring lid lubricators for sight gear. |
| Pump ... ... ... ... | 4 | 1 on top (automatic)<br>1 in feed pipe.<br>1 in each outer bearing of winch handle shaft. |

**2. List of lubricators—*cont.***

| Fittings to be lubricated. | No. | Where situated. |
|---|---|---|
| Bearing, *breech mechanism* lever | 1 | *On top of carrier.* |
| Safety shutter ... ... ... | 1 | On top left side of carrier. |
| Carrier, hinge joint ... ... | 1 | On top of hinge pintle. |
| Breech screw *and pintle of carrier* | 1 | *On top of breech screw.* |

**List of lubricators (transporting vehicles).**

| Vehicle. | No. | Where situated. |
|---|---|---|
| Wagon transporting howitzer ... | 14 | 3 in gear casing of traversing gear.<br>1 in body for sliding surface on axletree.<br>2 in gear casing of raising gear.<br>2 in bearings for winch handle shaft of hauling gear.<br>3 over pivot of fore carriage.<br>1 in axis of hauling chain wheels front end.<br>1 in axis of each guide roller. |
| Limber transporting body and cradle. | 3 | On top of framework, for lubricating locking gear (Ackerman's Lock). |
| Carriage transporting body and cradle. | 2 | 1 on each side for brake gear. |
| Limber transporting bed ... | 3 | On top framework, for lubricating locking gear (Ackerman's Lock). |

## 2.—THE DIAL SIGHT AND CARRIER.

**(i.) The No. 7 dial sight.**

The dial sight when issued is in correct adjustment, watertight, with all cells and joints secured by screws. It is very unlikely that the interior will be required to be cleaned, and the dial sight must on no account be taken to pieces except by persons in possession of a certificate from the Artillery College stating that they are qualified to do so.

The body of the dial sight must be cleaned with a clean soft cloth and a little oil, which must be rubbed off afterwards, care being taken that the glass is not touched. The exterior of the eye lens and window should be cleaned with a soft cloth or chamois leather, which must be kept perfectly dry and clean and be used for this purpose only.

Dermatine or rubber eye-guards should not be unnecessarily exposed to extremes of temperature, to the sun's rays or to bright light.

Oil and grease will inevitably destroy rubber or dermatine, and prolonged contact with benzol, petrol and chemicals is undesirable. If, however, oil and grease get on the eye-guard, it should be immediately removed, either—

(*a*) By wiping with a clean rag soaked in benzol or petrol.

(*b*) By washing in water to which a little soap and soda have been added.

(c) By wiping off with a clean rag.

**(ii.) The No. 4 carrier.**

If the sight is loose in the bracket it may be due to :—

(*a*) The clamping screw head working out of its recess, making it impossible to clamp up. The remedy is to press the head into the recess and clamp.

(*b*) The bracket being worn or strained, owing to working the sight about when taking it out of the bracket or over-straining the clamping lever. In this case a clamp to compress the bracket should be fitted if available; if not, one side of the bracket should be tapped lightly and evenly with a hammer by an artificer, with the clamping screw loosened.

### 3. THE BREECH MECHANISM.

**(i.) General precautions.**

The breech mechanism should be dismantled periodically in order that it may be thoroughly cleaned.

The threads of the breech screw should be free from burrs. Should the screw not work easily when the obturator has been detached, the defect may often be remedied by careful filing by an artificer, but no portion of the thread should be cut away to remove a crack.

The breech should be kept covered up when possible to prevent dust and grit getting into the breech fittings. A cover is provided for this purpose.

The obturating pad should be examined to see that the canvas covering is intact and in working order. If the canvas cover is found to be loose or to overlap either of the protecting discs, the obturator should be changed.

The spare pad should be kept under compression in the box obturator.

The protecting discs should be carefully examined and should be replaced if the steel rings are eroded, burred or cracked.

When fitting the pad and discs on the axial vent, care must be taken that they are assembled in the correct order.

The face of the pad marked "front" should be towards the muzzle. One or more steel adjusting discs may be required between the obturator and the face of the breech screw when the pad is compressed by firing, but the obturator should always turn freely.

The obturating pad should be a close fit in the coned seating of the chamber when the breech is closed. To ascertain this, lightly cover the seating with a mixture of oil and tallow; close and open the breech; the outer end of the pad should be covered with grease from contact with the greased seating of the chamber. If it is found that the pad does not fit the seating closely, adjusting discs should be added until the breech closes with some difficulty. The breech should then be opened and closed until it works easily. Before use, the pad and disc should be well covered with tallow.

Every opportunity should be taken to keep the obturator and axial vent cool. This can be done by pouring water over it in position, or by sousing it thoroughly with a sponge cloth during or after firing.

The obturator should never be dismantled when hot if this can possibly be avoided.

When a new pad is fitted it must be expanded with a full charge.

**(ii.) To dismantle the breech mechanism.**

Before removing the mechanism the breech must be opened, lock and slide box removed, and the breech mechanism swung into the loading position.

Vent axial, safety shutter and obturator:—Remove the keep pin from the pin retaining axial vent nut and safety shutter and withdraw the latter clear of the recesses in the

axial vent nut and safety shutter. Unscrew the axial vent nut and remove it to the rear. Remove the spring vent axial. Withdraw the axial vent and obturator from the front end of the breech screw.

Breech screw :—Insert a screwdriver in the slot of the pin actuating retaining plate, press in the pin and partially revolve it by means of the screwdriver until the indicating arrow on the pin corresponds with the middle of the word "dismantle" on the breech screw. Withdraw the breech screw from the front end of the carrier.

Roller :—Remove the keep pin and roller axis pin, and withdraw the roller.

Lever breech mechanism :—Remove the keep pin from the lever, and nut from the crankshaft, and withdraw the breech mechanism lever.

Lever breech mechanism bearing, crankshaft and crosshead :—Remove the keep pin of the breech mechanism lever bearing securing bolt, and withdraw the securing bolt. Withdraw the bearing and crankshaft from the carrier ; at the same time remove the crosshead from the inner end of the crankshaft from inside the carrier.

Carrier :—Unscrew the clamping screw, and adjusting screw of ball bearing, and withdraw ball bearing securing caps and ball bearing from upper lug. Unscrew the retaining screw from upper lug and withdraw the lug with upper rolling bearing. Unscrew the clamping screw and retaining screw for lower roller bearing, and withdraw lower roller bearing, then remove the carrier from lower lug of breech ring.

**(iii.) To assemble the breech mechanism.**

The breech mechanism is assembled in the reverse order.

**(iv.) To dismantle the lock P.H. and slide box V.**

To remove the lock and slide box :—Open the lock. Remove the screw securing slide box. Unscrew the lock and slide box from the stem of the axial vent bush spindle.

The remove the lock from the slide box :—Remove the axis screw of the extractor. Press down the knob of the plunger retaining catch, then turn the actuating lever to the open position and remove the lock and extractor from the slide box.

To dismantle or change the striker :—Remove the lock from the slide box. Unscrew the actuating lever (left-handed thread). Remove the keep pin of the striker cap and withdraw the cap. Withdraw the striker from the actuating lever. Unscrew the nut striker. Withdraw the rebound collar, mainspring and mainspring collar from the striker spindle.

To dismantle the actuating lever :—Remove the keep pin. Remove the pin guide retaining catch. Withdraw the plunger and spring.

**(v.) To assemble the lock P.H. and slide box V.**

The lock and slide box are assembled in the reverse order.

## 4. RECUPERATOR AND BUFFER.

### General precautions.

**(i.) Before firing.**

Care should be taken to see that the recuperator and buffer are correctly charged, that there is no leakage at the stuffing boxes, that the buffer cylinder is firmly nutted up to

the lug of the gun and the piston rod to the front of the cradle, that the recuperator cotter is in position, that the cut-off gear is in adjustment and that no keep pins are missing.

It is necessary to strain the oil before charging the recuperator or buffer.

During severe weather, recuperators and buffers should be protected as much as possible from the cold.

Recuperator and buffer cylinders should be washed out with paraffin to remove grit as opportunities offer.

**(ii.) In action.**

During action the functioning of the system should be carefully watched and steps taken at once to remedy defects.

The following are the more common faults:—

For any given fault the causes and remedies are set out in the sequence which should be followed to ascertain the particular cause and remedy, so that the simplest and most readily removed causes may be eliminated before proceeding to the more difficult.

| Fault. | Cause. | Remedy. |
|---|---|---|
| Recoil violent ... | Air in buffer cylinder ... | Operate shifting valve. |
| | Insufficient liquid in buffer system. | Fill buffer and tank. |
| | Reduced air pressure in recuperator. | Test and recharge recuperator. |
| Recoil excessive ... | Wear of piston and valve | Adjust by cut-off gear. |
| | Buffer nearly empty ... | Fill buffer and tank. |

| Fault. | Cause. | Remedy. |
|---|---|---|
| Recoil short ... | Damaged slides ... | Examine and repair. |
| | Excessive air pressure ... | Test and expel surplus. |
| | Wrongly set cut-off gear | Test and adjust gear. |
| | Excess of liquid in recuperator. | Test and recharge recuperator. |
| | Packings too tight ... | Repack. |
| Run out slow ... | Plug adjusting run-out incorrect. | Enlarge flats on plug. |
| | Burrs or grit on slides ... | Remove obstruction. |
| | Reduced air pressure ... | Test and adjust pressure. |
| | Packings too tight ... | Repack. |
| Run-out violent ... | Plug adjusting run-out incorrect. | Exchange with plug with smaller flats. |
| | Excessive air pressure ... | Test and expel surplus. |
| Failure to run out ... | Too much liquid in buffer. | Operate snifting valve. |
| | Air in buffer ... ... | Operate snifting valve. |
| | Plug adjusting run-out closed. | Examine and replace plug. |
| | Burrs or grit on slides ... | Remove obstruction. |
| | Reduced air pressure in recuperator. | Test and adjust pressure. |
| | Packings too tight ... | Repack. |

NOTE.—Reduced air pressure may be due to air alone, or may be caused by leakage of liquid from recuperator; the precise cause should be ascertained.

**(iii.) When guns are resting in action.**

Cool the bore. Allow air to escape from the buffer by the air release valve. Replenish the buffer if necessary. Tighten packings if necessary. Test the air pressure after the gun has cooled.

## 5. THE RECUPERATOR.

**(i.) General precautions.**

Before removing the recuperator cotter the apparatus securing the recuperator ram must be fixed.

The gun must never be fired if the amount of leakage indicated by the tail rod exceeds 8 pints, or if the air pressure is below 350 lbs. a sq. in.

**(ii.) To charge the recuperator with liquid.**

Secure the gun to the cradle by the buffer locking pin and elevate the gun about 5 degrees. Discharge any air pressure in the air cylinder by removing the closing plug and opening the by-pass valve. Push the tail rod into the air cylinder as far as it will go. Remove the filling and air hole plugs.

Pour oil through a funnel into the filling hole until it overflows at the air hole. Replace the plugs.

About 32 pints of oil are required to fill the recuperator.

**(iii.) To charge the recuperator with air.**

Secure the gun to the cradle by the buffer locking pin and elevate the gun about 5 degrees. Remove the closing plug and connect up the pressure gauge and air pump.

Slacken the locking nut, open the by-pass valve and pump until the gauge registers 500 lbs. a sq. in.

Slacken the filling plug one turn and allow liquid to escape until the tail rod indicator reads zero. Screw up the filling hole plug.

Close the by-pass valve, disconnect the pipe from the adapter and place the cap on the adapter. Let the pressure

down slowly to 475 lbs. a sq. in. by opening the by-pass valve slightly and slacking back the cap on the adapter.

When the pressure reads 475 lbs., close the by-pass valve, tighten the locking nut, remove the adapter with pressure gauge and replace the closing plug.

NOTE.—The recuperator should be tested to see that the air and liquid do not get past the floating piston.

**(iv.) To test and adjust for liquid in air cylinder.**

Secure the gun to the cradle by the buffer locking pin and elevate to about 25 degrees, remove the closing plug and open the air valve about two turns.

If air alone escapes there is no leakage; close the valve. Should liquid show allow it all to escape before closing the valve.

Recharge with air in the usual way, up to the correct pressure.

If leakage of oil into the air cylinder continues the packing of the floating piston must be examined and replaced if necessary.

**(v.) To test and adjust for aeration of liquid in recuperator.**

Secure the gun to the cradle by the buffer locking pin and elevate to about 5 degrees; unscrew the filling plug one turn. If liquid flows, close the plug, but, if froth appears, air has leaked into the liquid. Allow the froth to blow out until liquid flows, then close the plug and make up loss of oil in the usual manner.

Should the amount of froth be excessive, it will be necessary to strip the recuperator and to examine the packings, replacing any that may be defective.

**(vi.) To test the air pressure.**

Remove the closing plug and attach the adapter and pressure gauge. Blank the outer end of the adapter with the cap. Slacken the locking nut, open the by-pass valve and the gauge should register between 350 and 475 lbs. a sq. in.

If the pressure is correct, close the by-pass valve, tighten the locking nut, remove the adapter and gauge and replace the closing plug. If the pressure is below 350 lbs., close the by-pass valve, connect up the air pump and make up the pressure to 475 lbs.

**(vii.) To replenish air pressure lost by leakage.**

Proceed as for charging the recuperator with air, but, before opening the by-pass valve to admit air to the recuperator, pump the pressure in the pipe up to 475 lbs. a sq. in. and see that the correct amount of liquid is in the recuperator.

**(viii.) To empty the recuperator.**

Secure the gun to the cradle and elevate about 5 degrees.

Discharge the air pressure by removing the closing plug and opening the by-pass valve.

Remove the air hole plug and the drain plug, and allow the liquid to run out into a suitable vessel.

**(ix.) To replace the tail rod packing.**

Secure the gun to the cradle and empty the recuperator. Unpin and remove the indicator tube from the crosshead, and remove the stop plate from the front end of the tail rod. Unscrew the gland and remove the packing with its supporting rings. Unscrew the protecting ring and remove the U washers with their supporting rings. Renew the defective rubber or packing and replace the gland, packings and rings, taking

care that the packings are not damaged. Replace the stop plate and indicator tube, and re-charge the recuperator.

**(x.) To replace the ram packing.**

Secure the gun to the cradle and empty the recuperator. Unpin and remove the indicator tube. Disconnect the ram from the crosshead and force it into the air cylinder. Remove and renew the packings as described in section 5 (ix). Draw the ram to the front and connect it to the crosshead, replace the indicator tube, and re-charge the recuperator.

**(xi.) To renew the rubber packings on the head of the floating piston.**

Secure the gun to the cradle and empty the recuperator. Unpin and remove the indicator tube and crosshead, and dismantle the tail rod gland and ram gland. Remove the ram and floating piston to the front. Unscrew the collars securing the rubbers on the floating piston and remove them with their supporting rings. Renew the defective rubber and replace the rubbers, supporting rings and screwed collars. Replace the floating piston and ram in the air cylinder. Replace the ram gland and crosshead and connect the ram to the crosshead. Replace the tail rod gland and indicator tube, and re-charge the recuperator.

## 6. THE BUFFER.

**(i.) To fill the buffer.**

Remove the air and filling hole plugs in the top of the tank and elevate the gun about 5 degrees. Press in the air release valve and pour oil into the tank until it overflows at the air release valve. Release the valve, fill the tank, and replace the air and filling hole plugs.

About 12 gallons of oil are required to fill the buffer and tank.

**(ii.) To empty the buffer.**

Elevate the gun about 5 degrees. Remove the air hole plug of the tank and the drain plug of the buffer cylinder, and run the oil off.

If it is desired to empty the buffer completely, the gun is depressed and the stuffing box removed.

**(iii.) To tighten the gland.**

Lay the gun horizontal. Disengage the locking plunger and tighten the outer gland by means of the spanner provided. Re-engage the locking plunger.

The gland should not be over-tightened as this may cause seizure.

**(iv.) To renew the packing in the buffer gland.**

Empty the buffer and elevate the gun about 5 degrees. Disconnect the piston rod from the front bracket and the actuating gear from the piston rod. Unbolt and remove the front bracket and remove the securing collar from the piston rod. Disengage the locking plunger. Unscrew and remove the outer gland, supporting rings and packing. Unscrew and remove the inner gland and L rubber. Renew the defective rubber or packing and replace the glands, packings and rings, taking care that the packings are not damaged in passing over the screw threads of the piston rod. Re-assemble the securing collar bracket and actuating gear, and refill the buffer.

**(v.) To renew the L washer in the stuffing box.**

Proceed as in section 6 (iv); after removing the glands, remove the locking plate and unscrew the stuffing box, together with the defective packing and supporting ring. Renew the packing. Replace the supporting ring, packing and stuffing box. Re-assemble and refill the buffer.

## 7. THE AIR PUMP.

A dust cover is provided with the pump. The cover must be kept on when the pump is not in use.

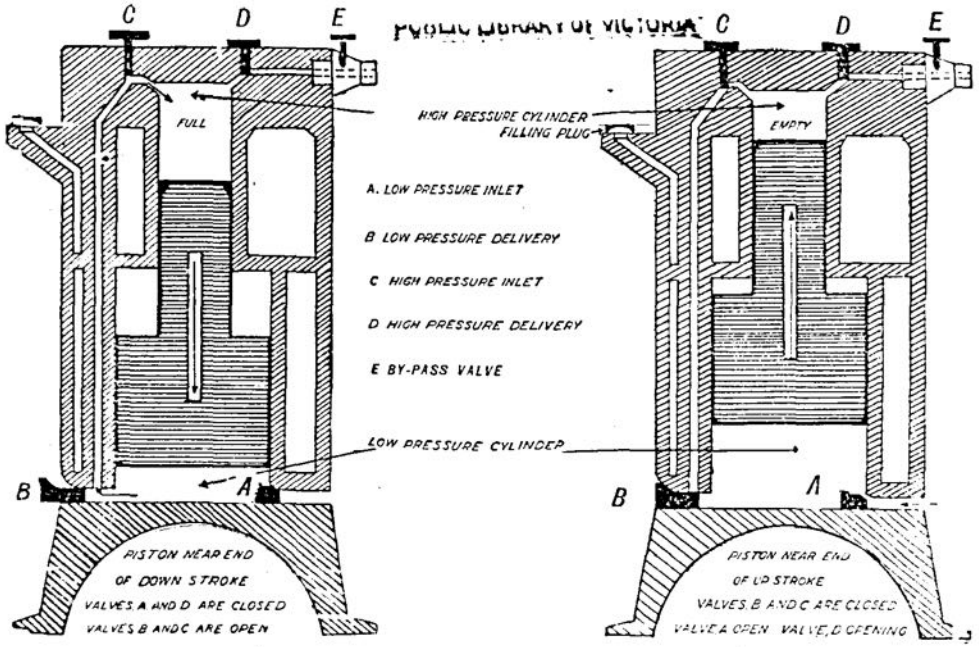
The water jacket must be kept filled when the pump is in action. In cold weather empty the jacket immediately after action and close valve A to prevent dirt and grit entering the cylinder when standing. Open again when putting the pump into action and set the sight feed lubricator to give eight drips per minute.

Before charging the recuperator it is advisable to test the pump system as follows:—Close the air charging valve of the recuperator. Work the pump slowly until the gauge registers 500 lbs. a sq. in. If the system is in good working order the gauge hand should remain stationary, or only creep back very slowly. Should the hand fall back quickly the system should be examined for external faults. Faults may be located by smearing wheel grease over the joints; air bubbles will be observed where there is a leak.

Great care should be exercised in using the gauge. When taking or releasing pressure the valve should be opened gently in order to prevent damage to the gauge.

If the pump only gives 20 lbs. pressure, valves B and C are faulty. If the pump only gives 200 lbs. pressure valve D is faulty. If no air is delivered valve A is faulty. If the valves are proved to be in order, look to the packing rings of the piston. In the event of valve D going out of order, and no spares being available, replace it with valve B; valve C should not be used for this purpose.

If necessary the valves should be lightly ground in and coated with thin oil.



# APPENDIX.

## WEIGHTS AND DIMENSIONS OF LOADS.

### 1. The bed.

| | tons. | cwt. | qrs. | lbs. |
|---|---|---|---|---|
| Bed ... ... ... ... ... ... | 3 | 1 | 3 | 15 |
| *Carriage transporting* ... ... ... | 0 | 11 | 2 | 21 |
| 1 draught link ... ... ... ... | 0 | 0 | 2 | 8 |
| 2 lifting screws ... ... ... ... | 0 | 0 | 3 | 2 |
| Limber transporting ... ... ... | 0 | 17 | 3 | 22 |
| 1 lifting screw ... ... ... ... | 0 | 0 | 1 | 5 |
| Total ... ... ... | 4 | 13 | 0 | 17 |
| Earth box ... ... ... ... ... | 0 | 19 | 0 | 3 |
| Derrick ... ... ... ... ... | 0 | 2 | 0 | 16 |
| Platforms ... ... ... ... ... | 0 | 2 | 0 | 27 |
| Total weight travelling | 5 | 16 | 2 | 7 |
| Weight on front axle ... ... ... | 2 | 13 | 3 | 7 |
| Weight on rear axle... ... ... ... | 3 | 2 | 3 | 0 |
| Measurement tonnage ... ... ... | 23 | 10 | 0 | 0 |

| | |
|---|---|
| Total length without connector ... ... ... | 20 ft. 9 ins. |
| Total length with connector ... ... ... | 23 ft. 1 in. |
| Greatest height (top of wheels) ... ... ... | 5 ft. |
| Greatest width (ends of axles) ... ... ... | 9 ft. 1 in. |
| Wheel base ... ... ... ... ... ... | 14 ft. 6 ins. |
| Wheel track ... ... ... ... ... ... | 8 ft. |
| Angle of lock, right ... ... ... ... | 39 degrees. |
| Angle of lock, left ... ... ... ... ... | 40 degrees. |
| *Turning circle (diameter)* ... ... ... ... | 54 ft. |

## 2. The carriage.

| | tons. | cwt. | qrs. | lbs. |
|---|---|---|---|---|
| Carriage ... ... ... ... ... | 4 | 19 | 3 | 14 |
| Carriage transporting ... ... ... | 0 | 15 | 1 | 14 |
| Limber transporting ... ... ... | 0 | 16 | 0 | 8 |
| 2 lifting screws ... ... ... ... | 0 | 0 | 2 | 13 |
| Total weight travelling ... | 6 | 11 | 3 | 21 |
| Weight on front axle ... ... ... | 2 | 8 | 3 | 14 |
| Weight on rear axle... ... ... ... | 4 | 3 | 0 | 7 |
| Measurement tonnage ... ... ... | 41 | 0 | 0 | 0 |

| | |
|---|---|
| Total length without connector ... ... ... | 19 ft. 8 ins. |
| Total length with connector ... ... ... | 21 ft. 11 ins. |
| Greatest height (top of gravity tank) ... ... | 9 ft. 3 ins. |
| Greatest width (ends of axles) ... ... ... | 9 ft. 1 in. |
| Wheel base ... ... ... ... ... ... | 10 ft. 9 ins. |
| Wheel track ... ... ... ... ... ... | 8 ft. |
| Angle of lock, right ... ... ... ... | 30 deg. 30 min. |
| Angle of lock, left ... ... ... ... | 36 deg. 15 min. |
| Turning circle (diameter) ... ... ... ... | 25 ft. |

## 3. The gun.

| | tons. | cwt. | qrs. | lbs. |
|---|---|---|---|---|
| Gun with breech fittings ... ... ... | 4 | 5 | 0 | 17 |
| Wagon transporting ... ... ... | 2 | 6 | 0 | 17 |
| Total weight travelling ... | 6 | 11 | 1 | 6 |
| Weight on front axle ... ... ... | 2 | 15 | 2 | 6 |
| Weight on rear axle... ... ... ... | 3 | 15 | 3 | 0 |
| Measurement tonnage ... ... ... | 26 | 12 | 0 | 0 |

| | |
|---|---|
| Total length without connector ... ... ... | 16 ft. 6 ins. |
| Total length with connector ... ... ... | 19 ft. 3 ins. |
| Greatest height (top of gun lug) ... ... ... | 7 ft. 2 ins. |
| Greatest width (ends of axles) ... ... ... | 9 ft. 1 in. |
| Wheel base ... ... ... ... ... ... | 8 ft. |
| Wheel track ... ... ... ... ... ... | 8 ft. |
| Angle of lock ... ... ... ... ... | 37 degrees. |
| Turning circle (diameter) ... ... ... ... | 35 ft. |

The diameter of the turning circle of the three vehicles on train is 54 ft.

## 4. The Holdfast platform.

| | tons. | cwt. | qrs. | lbs. |
|---|---|---|---|---|
| 2 diagonal beams ... ... ... ... | 0 | 2 | 10 | 4 |
| 2 longitudinal beams ... ... ... | 1 | 18 | 2 | 0 |
| 1 cross beam... ... ... ... ... | 0 | 11 | 2 | 7 |
| 1 skid, cross beam ... ... ... ... | 0 | 3 | 0 | 14 |
| 2 diagonal stays ... ... ... ... | 0 | 0 | 3 | 3 |
| 15 planks ... ... ... ... ... | 0 | 10 | 2 | 4 |
| 2 wheel guides ... ... ... ... | 0 | 4 | 3 | 2 |
| 8 pegs securing bed... ... ... ... | 0 | 6 | 3 | 24 |
| Bolts, &c. ... ... ... ... ... | 0 | 0 | 3 | 16 |
| Total ... ... ... | 4 | 1 | 2 | 18 |

| | |
|---|---|
| Diagonal beams, each ... ... | 14 ft. × 12 ins. × 12 ins. |
| Longitudinal beams, each ... ... | 19 ft. 7 ins. × 19 ins. × 11 ins. |
| Cross beam ... ... ... ... | 14 ft. 6 ins. × 6½ ins. × 10½ ins. |
| Skid, cross beam ... ... ... | 8 ft. × 12 ins. × 12 ins. |
| Planks, each ... ... ... ... | 10 ft. 7 ins. × 10 ins. × 3 ins. |
| Wheel guides... ... ... ... | 11 ft. 10 ins. × 11½ ins. × 2½ ins. |



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